UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/080,805	02/21/2002	Tong Fang	2002P02988 US	9912

7590 12/09/2004

Siemens Corporation
Intellectual Property Department
186 Wood Avenue South
Iselin, NJ 08830

EXAMINER	
STREGE, JOHN B	

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 12/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/080,805	FANG ET AL.	
	Examiner	Art Unit	
	John B Strege	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 February 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *2,4,5,9,10,12,13 and 17* is/are allowed.

6)☒ Claim(s) *1,6-8 and 14-16* is/are rejected.

7)☒ Claim(s) *3 and 11* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claims 3 and 11 objected to because of the following informalities: Claims 3 and 11 both contain confusing grammar making it difficult to understand the claims. Appropriate correction is required. Examiner suggests for example, "The method of claim 2, wherein the step of determining a projection further comprises the step of projecting a row or column of an image of the balls in a direction, wherein the direction is one of horizontal or vertical." As they dependent on allowable subject matter claims 3 and 11 would be allowable if rewritten to overcome the objection.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1, 6-8 and 14-16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding the claims there is an inconsistency between the claims and the specification disclosure. The Applicant's attention is directed to MPEP section 2173.03.

Claim 1 contains circular logic in that in the way it is written it is necessary to determine the number of objects in order to determine an adaptive threshold, then the adaptive threshold is used to determine an inter-object distance, and finally the inter-object distance is used to determine the number of objects. Thus the adaptive threshold

needs to determine the number of objects in order to carry out a determination of the number of objects. There is nothing to distinguish that the "number of objects" (lines 6-7) used to determine the adaptive threshold differs from "the number of objects" (line 10) according to the inter-object distance. For examination purposes the examiner will evaluate line 10 as "determining a final number of objects" thus providing a distinction between lines 6-7 and line 10 and eliminating the circular logic problem.

Another inconsistency present in claim 1 arises regarding the adaptive threshold. Specifically lines 8-9 state, "determining an inter-object distance according to an average inter-peak distance at the adaptive threshold". However according to the specification the inter-object distance is determined for a number of given thresholds in order to determine the adaptive threshold (see at least page 18 lines 10-12, and page 20 lines 1-12). Thus by the time the adaptive threshold is determined the inter-object distance is already known for each of the given thresholds. It is possible that the inter-object distance is determined again based on the adaptive threshold, but this is not disclosed in the specification and furthermore it would be a redundant step as the inter-object distance must have already been calculated for each threshold in order to determine the number of objects (see figures 8-9 and equation at the bottom of page 18). For examination purposes lines 9-10 will be interpreted as "determining an inter-object distance according to an average inter-peak distance at the threshold".

Claims 6-7 (dependent on claim 2) and claims 14-15 (dependent on claim 10) are also inconsistent with the specification in that they state the "given threshold is determined". According to the specification an adaptive threshold determination

determines a threshold value within a given threshold range (page 20 lines 1-12), thus it is an adaptive threshold that is determined, not the given threshold. Furthermore claims 7 and 15 also contain the same circular logic as discussed for claim 1 since there is nothing to distinguish the "determined number of balls" for each given threshold (line 3 of claim 7 for example) from the "determining (a final) number of balls" (last line of claim 2 for example). Claims 8 and 16 are dependent on rejected claims.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claim 1 as best understood by the examiner is rejected under 35 U.S.C. 103(a) as being unpatentable over Christian et al. USPN 4,696,047 (hereinafter Christian) in view of Florent USPN 5,832,111.

Claim 1 discloses, "A method for determining a number of objects comprising the steps of: determining a projection space including the objects, wherein a distance between two adjacent objects is substantially the same for each pair of adjacent objects; determining an adaptive threshold according to a number of objects determined to be in the projection space; determining an inter-object distance according to an average inter-peak distance at the adaptive threshold; and determining a (final) number of objects in the projection space according to the inter-object distance.

Christian discloses an apparatus for automatically inspecting electrical connecting pins (col. 1 lines 5-10). As seen in figure 3 an intensity profile of the pins (projection space of the objects) is determined. The distance between the adjacent pins is substantially the same. A threshold is established in order to separate the pins from the background (col. 3 lines 32-34, and paragraph bridging cols. 5-6). Christian does not disclose that this is an adaptive threshold. Each of the pins is located based on the threshold, the distance between the pins are measured from interpeak distance of the threshold and finally the distance between each pin pair is compared against a predefined tolerance (col. 3 lines 38-46). Christian further discloses summing the total of all the pins (col. 6 lines 18-20).

Christian does not explicitly disclose "determining an adaptive threshold according to a number of objects determined to be in the projection space" or that the determining of the number of (final) objects is "according to the inter-object distance."

Florent discloses a method and device for segmentation of a signal representing a digital image with a threshold obtained using a histogram (title of the invention). Florent teaches that in the prior art, thresholding an image with a lot of noise resulted in great inaccuracy (col. 3 lines 8-25). In order to improve the determination of a threshold Florent recites, "accumulating counts of isolated objects in respective threshold images obtained by thresholding the digital image at respective grey levels, the counts as a function of the grey levels froming a histogram, determining a segmentation threshold automatically on the basis of the histogram, and thresholding the digital image at the determined segmentation threshold (col. 3 lines 26-40, also the abstract).

Neither Christian nor Florent explicitly disclose that the number of objects is determined based on the inter-object distance. However Christian states that once a first pin has been isolated and identified, and knowing the expected distance between the pins, it is easy to identify the location of all the pins and to compensate for variation of pin position (col. 3 lines 25–32). Furthermore it is well known in general mathematics that knowing the distance (y) between a plurality of equally spaced objects and the total distance (x), the number of objects can be obtained by dividing x by y and adding 1. Therefore as it is necessary for the procedure of Florent to determine the number of objects to obtain the adaptive threshold and Christian discloses a uniform structure where it is easy to calculate the number of objects based on the distance between the pins it would have been obvious to one of ordinary skill in the art to determine the number of objects based on the inter-object distance of the pins.

Christian and Florent are analogous art because they are from the same field of endeavor of thresholding an image to obtain information about the objects.

At the time of the invention it would have been obvious to one of ordinary skill in the art to use an adaptive threshold according to the number of objects with the invention of Christian to obtain a threshold that accounts for noise in the segmentation. The motivation for doing this is that it would make the inspection more accurate. Thus it would have been obvious to one of ordinary skill in the art to combine Christian and Florent to obtain the invention as specified in claim 1.

Allowable Subject Matter

6. Claims 2, 4-5,9-10,12-13, and 17 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: Regarding claim 2 none of the prior art discloses a method for determining a number of balls in a projection space comprising the steps of: determining a projection of a ball grid array, determining an inter-ball distance for each pair of adjacent balls that has the maximum value of the inter-peak distance histogram, and verifying the position of the first ball and the positon of the last ball based on a general inter-ball distance. The closest prior art comes from USPN 4,696,047 (discussed above), 5,832,111 (discussed above), and USPN 6,614,926 Fix et al however they fail to disclose these limitations. Thus claim 2 is allowable.

Claim 10 is a program storage device readable by machine equivalent of the method of claim 2. Thus claim 10 is allowable for the same reasons as claim 2.

Claims 4-5,9-10,12-13, and 17 are dependent on allowable claims thus they are allowable for the same reasons.

7. Claims 6-8, and 14-16 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

USPN 5,936,665 Vachtsevanos et al. Discloses using an auto-adaptive threshold to count the numbe of pilling in textile fabrics.

EP 0 149 685 Method for automatically counting etched pits.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS

BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600